

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

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In the Matter of	)	
	)	
Microsoft Petition for Rulemaking Seeking	)	ET Docket No. 14-165
Amendment of Part 15 of the Commission's Rules	)	RM-11840
for Unlicensed Operations in the Television Bands,	)	
Repurposed 600 MHz Guard Bands and Duplex	)	
Gap, and Channel 37	)	
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**REPLY COMMENTS OF SHURE INCORPORATED**

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## TABLE OF CONTENTS

<b>SUMMARY .....</b>	<b>iii</b>
<b>I. SHURE SUPPORTS EFFORTS TO EXPAND RURAL BROADBAND DEPLOYMENT BUT MICROSOFT’S PROPOSALS (AS DRAFTED) CREATE UNACCEPTABLE RISKS OF HARMFUL INTERFERENCE AND MUST BE REVISED TO SPECIFICALLY PREVENT PROPOSED OPERATIONS OUTSIDE OF RURAL AREAS .....</b>	<b>3</b>
<b>II. THE FCC SHOULD EXAMINE THE CURRENT STATUS OF THE FLAGGING WHITE SPACE DATABASES AND CONSIDER PRACTICAL SOLUTIONS BEFORE TAKING STEPS TO AMEND THE RULES AS PROPOSED BY MICROSOFT .....</b>	<b>4</b>
<b>III. THERE IS WIDESPREAD SUPPORT FOR EXPANDING PART 74 LICENSE ELIGIBILITY TO PROTECT SMALLER SCALE PROFESSIONAL WIRELESS MICROPHONE OPERATIONS MANY OF WHICH OCCUR IN RURAL AREAS .....</b>	<b>7</b>
<b>IV. THE PUBLIC RECORD AND FCC PRECEDENT SUGGEST THE COMMISSION SHOULD REJECT OR SUBSTANTIALLY MODIFY MICROSOFT’S MOBILE PLATFORMS PROPOSAL .....</b>	<b>10</b>
<b>V. THE WI FI ALLIANCE HAS NOT ADEQUATELY EXPLAINED HOW ITS PROPOSAL TO EXPAND IOT OPERATIONS WOULD PROTECT WIRELESS MICROPHONES AND SHOULD NOT BE CONSIDERED AT THIS TIME .....</b>	<b>14</b>
<b>VI. CONCLUSION .....</b>	<b>16</b>

## SUMMARY

Shure continues to believe the Commission should not move forward with the Microsoft Petition unless it first protects wireless microphone operations by:

- Limiting the geographic scope of devices operating pursuant to Microsoft's proposed rule changes to "less congested areas" as defined by FCC rules;<sup>1</sup>
- Continuing to prohibit fixed WSD operation on channels adjacent to assigned TV channels;
- If considered at all, only permitting Microsoft's geofenced "mobile fixed device" to operate at dramatically lower powers and subject to all rules, including distance separation rules, that apply to fixed WSDs;
- Examining the status of the WSD database and taking steps to ensure its successful operation;
- Adopting a rule that expands Part 74 eligibility to professional wireless microphone users who may not be eligible under the current rules which restrict eligibility to users who routinely use 50 microphones or more;<sup>2</sup> and
- Considering the proposed narrowband operations only to the extent that they comply with the same emission mask requirements as wireless microphones.

With that said, based on the public record in this proceeding and closely related ones, Shure would like to further emphasize that:

- a. The WSD database has failed to launch and the FCC should fix it before moving forward with Microsoft's proposals;
- b. Smaller scale wireless microphone operations, many of which are in rural areas, need expanded Part 74 license eligibility;
- c. The public record and FCC precedent indicate that the Commission should either reject Microsoft's mobile platforms proposal or consider only a significantly revised version at this time; and

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<sup>1</sup> See *infra* Part III.

<sup>2</sup> See 47 C.F.R. § 74.801(h).

- d. The Wi-Fi Alliance has not adequately explained how its proposal to expand IOT operations would protect wireless microphones and should not be considered at this time.

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**REPLY COMMENTS OF SHURE INCORPORATED**

Shure Incorporated (“Shure”), by its undersigned counsel, hereby submits these reply comments on Microsoft’s Petition for Rulemaking in the above-captioned proceeding.<sup>3</sup> Upon careful review of the public record in both this proceeding and closely related ones, Shure would like to further emphasize certain points it believes will be critical for the successful implementation of the White Space regulatory regime. Further review of the record has solidified Shure’s conviction that the FCC must address the systemic failure of the TV White Space database system. Rather than putting the proverbial cart in front of the horse, the Commission should remedy the absence of reliable, ubiquitous access to White Space databases designed to protect wireless microphones and other spectrum users from interference from the two *existing* classes of White Space Devices (“WSDs”) before contemplating the introduction of a *new* class of high-powered mobile WSD, as proposed by Microsoft. Shure also continues to believe that expanding eligibility to obtain Part 74 licenses is now, more than ever, critical to protecting

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<sup>3</sup> *In the Matter of Amendment of Part 15 of the Commission’s Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Guard Bands and Duplex Gap, and Channel 37*, Petition for Rulemaking of Microsoft Corporation (filed May 3, 2019) (“Microsoft Petition”).

professional wireless microphone operations whose productions and users require high quality, uninterrupted audio. The company appreciates the Commission's commitment to bridging the digital divide and enhancing rural access, but believes that the record in ET Docket No. 14-165 unequivocally shows that numerous rural organizations spanning civil society, the arts, and education need protection from harmful interference. Shure hopes the Commission will take the time to hear the stories of such concerned citizens and provide them with the technical safeguards they deserve. Shure remains deeply concerned about Microsoft's mobile platforms proposal. Even proponents of the Microsoft Petition have questioned the viability of the proposal as currently structured. Microsoft has yet to address why the Commission should effectively overturn the decision it made to reject high-powered mobile WSD operations in its *2010 TV White Spaces Order*.

Finally, Shure encourages the Commission to view the Wi-Fi Alliance's suggestions for expanding IOT operations with a healthy degree of skepticism. The Wi-Fi Alliance has not adequately explained how it would protect wireless microphone users from interference if the Commission were to make the rule changes suggested. Among other information, the Commission would need to evaluate specific proposals for power output levels, emissions mask, RF intermodulation, switching transients, and operating time for IOT operations, detailed technical and operational justification for these parameters, and an analysis of anticipated interference impacts of IOT operations pursuant to these parameters and necessary protections against such interference. In the absence of this information and analysis, the Commission should not proceed forward with the Alliance's suggestion at this time.

**I. SHURE SUPPORTS EFFORTS TO EXPAND RURAL BROADBAND DEPLOYMENT BUT MICROSOFT’S PROPOSALS (AS DRAFTED) CREATE UNACCEPTABLE RISKS OF HARMFUL INTERFERENCE AND MUST BE REVISED TO SPECIFICALLY PREVENT PROPOSED OPERATIONS OUTSIDE OF RURAL AREAS**

Shure supports efforts to bridge the digital divide and bolster broadband connectivity in rural and remote areas. Shure has long recognized the value of TV White Spaces for enhancing rural access and continues to see promise in such deployment scenarios. With that said, as the company explained in its initial comments,<sup>4</sup> if the Commission decides to consider amendments to the White Spaces rules proposed by Microsoft, it should only do so under the following principles:

- The geographic scope of devices operating pursuant to Microsoft’s proposed rule changes must be limited to “less congested areas” as defined by FCC rules;<sup>5</sup>
- Fixed WSD operation on channels adjacent to assigned TV channels must continue to be prohibited;
- The public record and FCC precedent indicate that the Commission should either reject or significantly revise Microsoft’s geofencing mobile platforms proposal. At a minimum, Microsoft’s proposal requires significantly more study and should only be considered at dramatically lower powers and subject to all rules, including distance separation rules, that currently apply to fixed WSDs.
- The status of the WSD database must be examined and the Commission must take steps to ensure its successful operation;
- Part 74 license eligibility rules must be amended to include professional wireless microphone users who may not be eligible under the current rules (which restrict eligibility to users who routinely use 50 microphones or more). Numerous smaller scale wireless microphone operations, many of which are in rural areas, deserve access to Part 74 licenses and the interference protection that comes with licensing;

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<sup>4</sup> See Shure Comments on Microsoft Petition at 2-3.

<sup>5</sup> Less congested areas are defined as geographic areas where at least half of the TV channels for the bands that will continue to be allocated and assigned only for broadcast service are unused for broadcast and other protected services and available for white space device use. Less congested areas in the UHF TV band are also considered to be less congested areas in the 600 MHz service band. See 47 C.F.R. § 15.703(h).

- Narrowband operations should be considered only to the extent that they comply with the same emission mask requirements as wireless microphones; and
- The FCC should either reject the Wi-Fi Alliance’s efforts to expand IoT operations or, at the very least, require the submission of specific technical and operational parameters and their justification and an analysis of anticipated interference impacts.

## **II. THE FCC SHOULD EXAMINE THE CURRENT STATUS OF THE FLAGGING WHITE SPACE DATABASES AND CONSIDER PRACTICAL SOLUTIONS BEFORE TAKING STEPS TO AMEND THE RULES AS PROPOSED BY MICROSOFT**

Shure appreciates the significant time and resources devoted by the Commission and interested parties that went into devising and implementing the White Spaces regulatory framework including the key role of the geolocation database. However, the operational reality is that the White Space Databases have not launched as planned and today are not the ubiquitous, well-resourced, real-time mechanism widely available to manage disparate uses of the same spectrum that was envisioned when the framework was adopted. As Shure and Sennheiser pointed out in the initial comments,<sup>6</sup> and numerous parties have informed the Commission in other contexts,<sup>7</sup> the TV White Space Databases are flagging in practice. These databases were intended to be a primary resource for wireless microphone operators to identify available frequencies and to act as a mechanism for interference protection in a shared spectrum band. Even if the

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<sup>6</sup> See Shure Comments on Microsoft Petition at 9-10; Sennheiser Comments on Microsoft Petition at 2-3.

<sup>7</sup> See, e.g., Comments of APCO International on 6 GHz NPRM, ET Docket No. 18-295, n. 5 (filed Feb. 15, 2019) (discussing the “dysfunctional, inaccurate, and unpoliced” status of the white space databases); GE Healthcare Comments on *Amendment of Part 15 of the Commission’s Rules for Unlicensed White Space Devices*, NPRM,, ET Docket No. 16-56, 8 (filed May 6, 2016) (explaining how white space certification processes had already malfunctioned, “corrupting the integrity of registration information in the databases.”); iPosi, Inc. Reply to Petitions for Reconsideration on *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Order, GN Docket No. 12-354, 3 (filed Oct. 29, 2014) (agreeing with NAB that, in practice, there have been “substantial error rates in TV White Space databases”).



Commission were convinced that WSDs could operate under the revised rules as proposed by Microsoft, wireless microphone and other spectrum users would be at serious risk because the White Spaces Database that is a key component of Microsoft's interference protection plan is not operating reliably.<sup>8</sup> Therefore, before the Commission considers acting on Microsoft's proposed changes to the WSD regime, its first order of business should be mending the dysfunctional databases.

Under the existing WSD rules, Part 74 licensees are supposed to be able to register their operations in the White Space Database to ensure proper protection from WSDs. However, Shure has received consistent feedback from its customers that despite their substantial efforts to comply with the White Space rules and adhere to the database registration process, the WSD databases are not fully operating, and, in many cases, are unable to successfully register frequencies for protection from WSDs.<sup>9</sup> Sennheiser's initial comments completely corroborate the experiences of Shure's customers, noting that "[t]he white space database system... completely collapsed for many months", that "[a]ll TV white space portals... were off-line", and that "[t]here was no way to register for interference protection from WSDs, or for wireless microphone operators to check for local channel availability."<sup>10</sup>

Furthermore, numerous parties representing a wide variety of industrial interests have informed the Commission of the operational failures of the White Space databases in other contexts. In 2015, after conducting extensive field-testing to evaluate the day-to-day function of the White Space Databases, the National Association of Broadcasters ("NAB") was so disturbed

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<sup>8</sup> *Supra*, n. 12.

<sup>9</sup> Shure Comments on Microsoft Petition at 9-10.

<sup>10</sup> Sennheiser Comments on Microsoft Petition at 2-3.

by its findings that it filed an emergency motion asking the Commission to immediately suspend all database operations.<sup>11</sup> NAB’s testing revealed that the White Space Databases were rife with inaccurate information and that White Space Database users had, *inter alia*, either willfully or negligently “entered false or questionable devices names or ignored the requirement to identify themselves,” “provided invalid FCC IDs for registered devices,” “supplied fake serial numbers for registered devices,” and “falsified their contact information.”<sup>12</sup>

These operational failures have persisted throughout the years. Last year, in reviewing the operational functions of Nominet’s White Space Database, NAB found that the database failed to exchange data with other database providers, did not have a fixed TVWS registration utility, and contained incorrect channel information for full power television stations.<sup>13</sup> Other parties have since echoed NAB’s concerns, sharing the view that the TV White Space Databases remain “dysfunctional, inaccurate, and unpoliced.”<sup>14</sup>

Indeed, the malfunctions in the TV White Space Databases have been so severe that parties have begun to caution the Commission against importing this regulatory regime into other frequency bands and/or service rules. For example, in its comments on the NPRM in the 6 GHz proceeding,<sup>15</sup> Verizon claimed that, despite the reforms the FCC made to the White Space

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<sup>11</sup> NAB Emergency Motion for Suspension of Operations and Petition for Rulemaking at 12-13 (filed Mar. 19, 2015).

<sup>12</sup> *Id.* at 9-10.

<sup>13</sup> NAB Comments on Nominet White Space Database System Public Testing Public Notice, ET Docket No. 04-186 at 3 (filed Aug. 16, 2018).

<sup>14</sup> *See* Comments of APCO International, *supra* n. 7.

<sup>15</sup> *Unlicensed Use of the 6 GHz Band, et al.*, Notice of Proposed Rulemaking, FCC 18-147, para. 20 (rel. Oct. 24, 2018) (“6 GHz Band NPRM”).

Databases in response to NAB's emergency petition, "the nature of the database itself remains more of a standalone registration process that is unable to prevent harmful interference."<sup>16</sup> Moreover, in reply comments on the Mid-Band NOI,<sup>17</sup> a group of IEEE engineers went so far as to say that "[t]his database approach, if extended to a large universe of unlicensed devices, will surely lead to widespread and unavoidable interference."<sup>18</sup>

In light of the foregoing concerns, Shure believes the FCC should not act on Microsoft's modifications to the White Space rules until it addresses the underlying threshold issues of ensuring functional White Space Database operations and implementing proper oversight mechanisms that will prevent these issues from recurring.

### **III. THERE IS WIDESPREAD SUPPORT FOR EXPANDING PART 74 LICENSE ELIGIBILITY TO PROTECT SMALLER SCALE PROFESSIONAL WIRELESS MICROPHONE OPERATIONS MANY OF WHICH OCCUR IN RURAL AREAS**

Having thoroughly examined the public record in Docket 14-165,<sup>19</sup> Shure also believes that the Commission should not act on Microsoft's proposal until it acts on its open (and widely supported) proposal to expand Part 74 eligibility to ensure that smaller scale wireless microphone operations in need of high-quality audio receive the protections they require. As Shure explained

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<sup>16</sup> Verizon 6 GHz Band NPRM Comments at 9.

<sup>17</sup> *Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz*, GN Docket No. 17-183, Notice of Inquiry, 32 FCC Rcd 6373 (rel. Aug. 3, 2017) ("Mid-Band NOI").

<sup>18</sup> Reply Comments of IEEE-BTS on Mid-Band NOI at 5.

<sup>19</sup> *See generally* Comments filed in ET Docket No. 14-165 (more than one hundred comments filed in support of expansion of "Part 74 license eligibility to include persons and organizations that can demonstrate the need for professional, high-quality audio and have the capability of providing it through conscientious use of wireless microphones" filed since October 2, 2017).

in its initial comments, current rules limit Part 74 license eligibility to large-scale operations that routinely make use of 50 or more wireless microphones.<sup>20</sup> Although the Commission previously acknowledged that there are instances when a wireless microphone user that does not meet the 50-device threshold would have interference protection needs similar to a Part 74 licensee,<sup>21</sup> there are currently no avenues available under the rules for such users to obtain the interference protections they need. Since 2017, the FCC has had an open proposal to expand Part 74 license eligibility to wireless microphone users who can demonstrate “a particular need for, and the capability to provide, professional, high-quality audio that is integral to their events or productions.”<sup>22</sup>

While Shure<sup>23</sup> and similarly situated microphone manufacturers<sup>24</sup> continue to urge the FCC to act on its open proposal, it is worth recognizing that a significant number of users seeking Part 74 protections reside in rural America. Endeavors in less populated areas requiring clear, reliable professional audio include sporting events, performance venues, houses of worship, civic venues, and educational institutions. As the record in ET Docket No. 14-165 plainly demonstrates, the aforementioned use cases are not perfunctory abstractions for policymakers to idly ponder – they

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<sup>20</sup> Shure Comments on Microsoft Petition at 10.

<sup>21</sup> *See Unlicensed Operation in the TV Broadcast Bands and Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz band*, ET Docket Nos. 04-186 and 02-380, Second Memorandum Opinion and Order, 25 FCC Rcd 18661, 18674-75, ¶¶ 31-32 (2010).

<sup>22</sup> *In the Matter of Promoting Spectrum Access for Wireless Microphone Operations, et al.*, Order on Reconsideration and Further Notice of Proposed Rulemaking, GN Docket Nos. 14-166, 12-268, ET Docket No. 14-165, 32 FCC Rcd 6077, 6123 (2017) (“FNPRM”).

<sup>23</sup> *See generally* Shure Comments on Microsoft Petition.

<sup>24</sup> Sennheiser Comments on Microsoft Petition at 5.

are tangible, real-life organizations and people with limited budgets who stand to suffer serious harms if not extended Part 74 license protections under a duly recalibrated (and effectively operationalized) White Space Database regime.<sup>25</sup> By way of example, as explained in comments in ET Docket 14-165, the Historic Bama Theatre generously serves various constituencies beyond its immediate customer base, allowing several local high school theatre and community non-profit theatre and dance groups to use its facilities.<sup>26</sup> The theatre's director noted Bama's prior substantial investments in their wireless microphones and implored that given "that investment has been made, I would like some assurance that the system will work properly and without interference."<sup>27</sup> Similarly, the Oregon Cabaret Theatre stated that it typically uses "between five and thirteen wireless microphones per performance... six days a week, every week" and feared that adverse changes to the rules implicating wireless microphones would cost them "close to \$10,000, which is a significant percentage of our entire yearly operating costs."<sup>28</sup> These and other similarly situated parties deserve protection from harmful interference just as much as larger venues.

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<sup>25</sup> See, e.g., Comments of The Historic Bama Theatre (Tuscaloosa, Alabama) (filed Oct. 10, 2017); Comments of the Kansas City Repertory Theatre (filed Oct. 9, 2017); Comments of Lumpkin County High School (Dahlonega, Georgia) (filed Oct. 10, 2017); Comments of Richmond Symphony Orchestra (Richmond, Virginia) (filed Oct. 12, 2017); Comments of Purdue University School of Performing Arts (West Lafayette, Indiana) (filed Oct. 10, 2017); Comments of Rock Canyon High School (Highlands Ranch, Colorado) (filed Oct. 10, 2017); Comments of Nashville Ballet (filed Oct. 12, 2017); Comments of Bonny Eagle High School (Standish, Maine) (filed Oct. 11, 2017); Comments of Omaha Theatre Company (filed Oct. 11, 2017); Comments of UNC Charlotte (filed Oct. 10, 2017); Comments of Oregon Cabaret Theatre (Ashland, Oregon) (filed Oct. 9, 2017); Comments of Arkansas Repertory Theatre (Little Rock, Arkansas) (filed Oct. 11, 2017); Comments of Red Mountain Theatre Company (Birmingham, Alabama) (filed Oct. 11, 2017); Comments of Lee-Davis High School (Mechanicsville, Virginia) (filed Oct. 6, 2017); Comments of Casper College (Casper, Wyoming) (filed Oct. 11, 2017).

<sup>26</sup> Comments of The Historic Bama Theatre at 2.

<sup>27</sup> *Id.* at 3.

<sup>28</sup> Comments of Oregon Cabaret Theatre at 1-2.

While the Commission certainly must continue its important efforts to expand rural broadband access and deployment, it is equally important that the Commission ensure the protection of the many rural (and non-rural) stakeholders who are already making productive use of the spectrum for productions using wireless microphones. These smaller scale users who require professional grade audio are already needlessly susceptible to harmful interference under the existing White Space rule regime, and moving forward with Microsoft's proposals as currently drafted would only serve to exacerbate that issue. Accordingly, Shure believes that the Commission should adopt its open proposal to expand Part 74 eligibility before acting on the Microsoft proposals.

#### **IV. THE PUBLIC RECORD AND FCC PRECEDENT SUGGEST THE COMMISSION SHOULD REJECT OR SUBSTANTIALLY MODIFY MICROSOFT'S MOBILE PLATFORMS PROPOSAL**

Shure believes that various public filings in ET Docket 14-165 and the weight of FCC precedent both suggest that the Commission should either reject Microsoft's mobile platforms proposal or heavily revise it. As Shure explained in its initial comments, Microsoft's proposal to allow fixed White Space Devices to operate from "movable platforms" is effectively an attempt to do an end run around the existing rules by creating a new class of high power mobile devices. Sennheiser expressed similar concerns about the proposal, suggesting that if the FCC were to adopt the proposal, in addition to limiting its geographic scope to less congested areas and excluding aircraft and satellites, "the Commission should also exclude small vehicles such as personal cars, motorcycles, and the like."<sup>29</sup>

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<sup>29</sup> See Sennheiser Comments on the Microsoft Petition at 5.

However, wireless microphone manufacturers were not the only stakeholders who recognized that there are problematic aspects to the mobile platform's proposal. Even parties that were overall in favor of Microsoft's petition concede that the current structure of the mobile platform's proposal is flawed. For example, Nominet, a designated TV White Space Database administrator, called for "greater clarity in the rules"<sup>30</sup> and noted that, as drafted, the Microsoft proposal "is vague, does not address which set of locations would be sufficient for a given device with given planned movements, does not address how the moving device must behave where channel availability differs between those locations... [and] places on the WSD the burden of combining the channel availability across multiple locations [which] Nominet believes the WSDB is better equipped to do."<sup>31</sup> While Nominet frames the foregoing issue as a matter of mere clarification, it concedes too much, shows the proposal's lack of solid footing with respect to implementation, and potentially reveals a rift between WSD OEMs and database administrators over fundamental aspects of their respective responsibilities. Interestingly, while Adaptrum, a leading supplier of WSDs with "many years of on-the-ground experience with TV white space deployments" explicitly came out in favor of four out of five of Microsoft's proposals, the company was silent with respect to the mobile platforms proposal.<sup>32</sup> The fact that even proponents of Microsoft's petition seemingly have reservations about the mobile platforms proposal strongly suggests that the Commission should not move forward on the proposal as it is currently drafted.

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<sup>30</sup> See Nominet Comments on the Microsoft Petition at 2.

<sup>31</sup> *Id.* at 6.

<sup>32</sup> See Adaptrum Comments on the Microsoft Petition. See also WISPA Comments on the Microsoft Petition, which were similarly and conspicuously silent on the mobile platforms proposal despite their vocal support for other Microsoft proposals and the petition at large.

While the aforementioned commenters voiced perspectives that the FCC should carefully consider, it is important to recognize that the Commission already spoke on this matter nearly a decade ago when it considered and explicitly rejected a vehicle mounted WSD proposal by Motorola that arguably was less ambitious and aggressive than what Microsoft now seeks. In 2009, Motorola filed a petition for reconsideration in which it urged the Commission to create a third class of WSDs to “allow certain vehicle mounted devices to operate with higher power.”<sup>33</sup> The following year, in its *2010 TV White Spaces Order*, the FCC directly addressed and unequivocally denied Motorola’s proposal:

“We also recognize the increased range provided by operation at higher power levels would be particularly desirable for some applications, including rural service and mobile operations as suggested by Motorola... However, we... decline to establish a new class of higher power vehicle mounted portable devices.”<sup>34</sup>

In its petition, Microsoft openly admits that its school bus experiment in Hillman, Michigan “required an EIRP greater than 100 mW” to operate.”<sup>35</sup> However, Microsoft’s Petition fails to mention the fact that the FCC previously examined a very similar proposal and expressly declined to authorize higher power levels in the *2010 TV White Spaces Order*<sup>36</sup> and provides no detailed explanation of why the Commission should take a different approach now.

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<sup>33</sup> See *In re Unlicensed Operations in the TV Broadcast Bands, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Bands*, Petition for Reconsideration and Clarification of Motorola, Inc., ET Docket Nos. 04-186, 02-380 (filed Mar. 19, 2009), 15.

<sup>34</sup> See *In re Unlicensed Operations in the TV Broadcast Bands, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Bands*, Second Memorandum Opinion and Order, ET Docket Nos. 04-186, 02-380 (rel. Sept. 23, 2010), paras. 77-78.

<sup>35</sup> *Microsoft Petition* at 23.

<sup>36</sup> *2010 TV White Spaces Order* at para. 78 (“We are retaining the current 100 mW maximum transmitter power limit for Mode I and Mode II personal/portable devices and decline to establish a new class of higher power vehicle mounted portable devices.”).



In 2010, the Commission correctly recognized that the extended range that comes with WSDs mounted to mobile platforms would unacceptably increase both the likelihood of harmful interference and the difficulty of source identification.<sup>37</sup> It explicitly voiced concern that “the significant distances at which interference could occur from a personal/portable device operating at greater than 100 mW would make it very difficult to identify a device that is the source of interference.”<sup>38</sup>

While the Commission left open the possibility that it could revisit its decisions in the future,<sup>39</sup> over the course of the past decade, intervening events have reinforced why proposals akin to those of Motorola and Microsoft are a problem. Nearly ten years later, both of the aforementioned problems remain - mobile WSDs speeding down highways would still cover plenty of ground at speeds that would potentially interfere with numerous co-channel operations, and that same speed would make it difficult for fixed co-channel operators to identify the source (or sources) of interference.<sup>40</sup> If anything, the intervening period has only further illustrated why a mobile WSD category currently remains inappropriate. As was discussed at length above, the past decade has been fraught with systemic failures and false starts by the White Space Databases.

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<sup>37</sup> *Id.*

<sup>38</sup> *Id.*

<sup>39</sup> *2010 TV White Spaces Order* at para. 77.

<sup>40</sup> Shure does not find any comfort in Microsoft’s proposal to require such WSDs within 1.6 km of the boundary area given that (1) as recently as last year, NAB found that Nominet’s database was not properly tracking channel availability for TV broadcasts or effectively communicating with other databases (a seemingly low bar that the database administrator could not satisfy (see *supra*, Part III)), and (2) even Nominet admits that Microsoft’s proposal inappropriately tasks WSDs with making complex, real-time calculations that would seemingly be better addressed by the database administrators (*supra*, n. 28). Given that the databases apparently are still having difficulty consistently providing accurate data with respect to fixed tv stations, Shure believes it would be premature to expect the databases to be able to provide accurate, timely information to moving targets traveling at highway speeds in dynamic spectrum environments.

These problems are only exacerbated by the fact that Microsoft’s proposal fails to provide any limit on the size of the geography geofenced, the speed of movement of the vehicle that would be transmitting at high power while moving, or the separation distance carrying essentially a high power fixed antenna.

Accordingly, while Shure is skeptical that high power WSDs mounted to mobile platforms moving at highway speeds could ever effectively coexist with incumbent uses, before the Commission even contemplates authorizing such logistically daunting mobile WSD operations, the first order of business should be fixing the widespread and well-documented failures of the White Space Databases under the existing regime.

**V. THE WI FI ALLIANCE HAS NOT ADEQUATELY EXPLAINED HOW ITS PROPOSAL TO EXPAND IOT OPERATIONS WOULD PROTECT WIRELESS MICROPHONES AND SHOULD NOT BE CONSIDERED AT THIS TIME**

Finally, Shure briefly responds to the Wi-Fi Alliance’s request to expand IOT operations using WSD technologies. Shure encourages the Commission to treat such proposals with skepticism. In its comments on the Microsoft Petition, the Wi-Fi Alliance noted that, rather than moving forward with the duty cycle Microsoft proposed based on its agricultural IoT experiments, the Commission should “seek comment on other IOT applications that could conceivably utilize the VHF and UHF bands.”<sup>41</sup> As Shure explained in its initial comments, expanding the bandwidth of these IOT devices, and, in particular, relaxing the emissions mask, makes sharing a TV channel with other devices, including wireless microphones problematic.<sup>42</sup> Wireless microphones have to meet a relatively stringent emissions mask and IOT devices

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<sup>41</sup> Wi-Fi Alliance Comments on the Microsoft Petition at 8.

<sup>42</sup> Shure Comments on the Microsoft Petition at 14-15.

should be required to meet the same or a similar mask. At the very least, the issue of how much bandwidth these devices should be permitted to occupy needs further study.

The matter of "power scaling" is also of particular concern.<sup>43</sup> The Wi-Fi Alliance does not clearly define how they expect this to work, nor do they suggest a power cap, but recommend "scaling the conducted power limit per 100 kilohertz in narrowband devices to the upper channel size limit in narrowband white space devices" and claim "[f]or example, the conducted power limit in a 200 kilohertz narrowband channel would be 15.6 dBm."<sup>44</sup> Based on their example, a 400 kHz wide device would potentially be permitted to operate at 18.6 dBm, an 800 kHz wide device would be permitted 21.6 dBm and so on, up to more than 30 dBm at 6 MHz (more than one watt). Such power scaling seems far reaching and arguably excessive for an IOT device.

Moreover, the Wi-Fi Alliance's comments generally suggest that they have in mind greatly expanding where IOT devices would be permitted to operate beyond less congested areas. A building full of these devices talking at random times would make wireless audio transmissions completely unreliable. Interference that occurs randomly, even if for short periods of time, would seriously impair wireless microphone operation.<sup>45</sup> Nobody is prepared to tolerate intermittent interruptions or degradation to audio quality.<sup>46</sup>

While Wi-Fi Alliance suggests that the Commission could use a listen-before-talk contention-based mechanism to prevent simultaneous narrowband transmissions at a location,

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<sup>43</sup> See Wi-Fi Alliance Comments on the Microsoft Petition at 8.

<sup>44</sup> *Id.*

<sup>45</sup> See, e.g., Sennheiser Comments on the Microsoft Petition at 4-5.

<sup>46</sup> Shure has experienced a large increase in customer complaints about interference from smart meter transmissions in the 902 MHz band effectively rendering these systems unusable in many locations.

Shure does not believe such an approach to be practical. Listen-before-talk operations have been demonstrated to be incapable of reliably detecting wireless microphone transmissions even on a line of sight basis.<sup>47</sup> Furthermore, Wi-Fi Alliance's proposals raise the specter of hidden node issues – wireless microphone systems use separate transmitters and receivers with separate antennas. If an IOT device does not "hear" a wireless microphone transmitter and makes a transmission, it can interfere with a nearby wireless microphone receiver at a different location.

Accordingly, while Shure is deeply skeptical of the IOT proposals set forth by the Wi-Fi Alliance, should the FCC choose to move forward on such matters, it should require the Wi-Fi Alliance to submit into the record specific proposals for power output levels, emissions mask, RF Intermodulation, switching transients, and operating time for IOT operations, detailed technical and operational justification for these parameters, anticipated interference impacts of IOT operations pursuant to these parameters and an analysis of how IOT transmitters operating under revised rules would protect wireless microphones.

## **VI. CONCLUSION**

Shure urges the FCC to protect wireless microphones by:

- Limiting the geographic scope of devices operating pursuant to Microsoft's proposed rule changes to "less congested areas" as defined by FCC rules;
- Continuing to prohibit fixed WSD operation on channels adjacent to assigned TV channels;
- If considered at all, only permitting Microsoft's geofenced "mobile fixed device" to operate at dramatically lower powers and subject to all rules, including distance separation rules, that apply to fixed WSDs;

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<sup>47</sup> See, e.g., Office of Engineering and Technology "Initial Evaluation of the Performance of Prototype TV-Band White Space Devices," OET Report FCC/OET 07-TR-1006, July 31, 2007 (finding that neither device could reliably sense wireless microphones); Office of Engineering and Technology "Evaluation of the Performance of Prototype TV-Band White Space Devices Phase II," OET Report FCC/OET 08-TR-1005, October 15, 2008 (finding that devices could not adequately sense wireless microphones in adjacent channels when contending with DTV signals).

- Examining the status of the WSD database and taking steps to ensure its successful operation;
- Adopting a rule that expands Part 74 eligibility to the many rural (and non-rural) professional wireless microphone users who may not be eligible under the current rules which restrict eligibility to users who routinely use 50 microphones or more;<sup>48</sup>
- Considering the proposed narrowband operations only to the extent that they comply with the same emission mask requirements as wireless microphones; and
- Rejecting the Wi-Fi Alliance's efforts to expand IoT operations or, at the very least, requiring the Wi-Fi Alliance to submit specific technical parameters, justification and an analysis of anticipated interference impacts and protections.

Respectfully submitted,

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<sup>48</sup> See, e.g., 47 C.F.R. § 74.801(h).

## CERTIFICATE OF SERVICE

I, Catherine Wang, hereby certify that on June 25, 2019, copies of the foregoing Reply  
Comments of Shure Incorporated were sent via email to the following:

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